

Executive Summary

East Royalty / St Peters Road Traffic Study



Prepared for the

Prince Edward Island Department of Transportation and Infrastructure Renewal

and the **City of Charlottetown**

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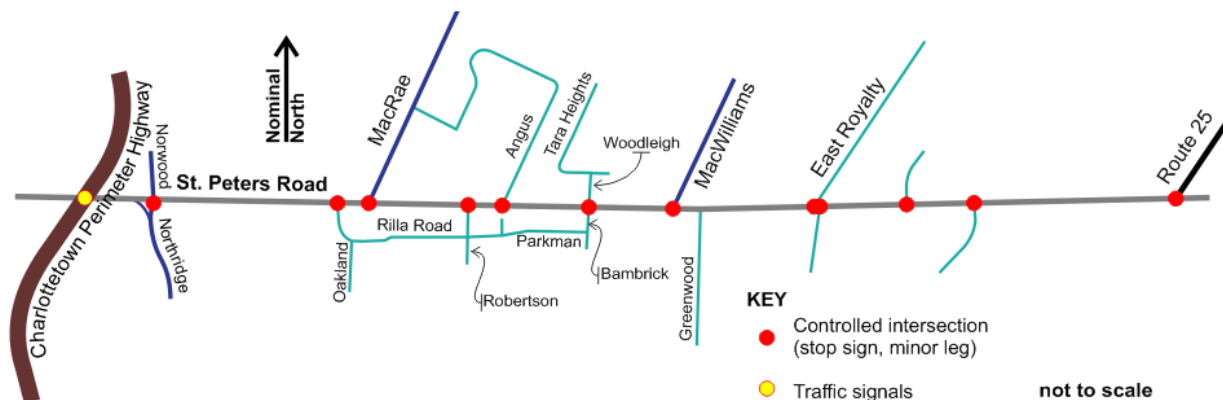
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Introduction

Recently proposed developments in the East Royalty area of Charlottetown triggered a traffic impact study for both the City of Charlottetown and the Prince Edward Island Department of Transportation and Infrastructure Renewal (TIR). Under existing network configurations, this development could lead to significant traffic operational challenges on St. Peters Road (Route 2) and intersecting roads. To assess the impacts and develop recommended solutions, this study encompasses a study area consisting of St. Peters Road between the Charlottetown Perimeter Highway/Riverside Drive to Route 25.

The traffic operational analysis includes both an Existing Condition Analysis and a Future Condition Analysis for both morning and afternoon peak periods.

Study Area Map



Note: For the purposes of this report, St. Peters Road (Route 2) shall be assumed to be aligned in an east-west direction.

Study Methodology

The existing network includes three provincial highways: Route 1/Charlottetown Perimeter Highway (a limited-access facility), Route 2/St. Peters Road (an arterial highway) and Route 25/York Road (a collector highway) and other collector/access roads under City jurisdiction that connect the local residential areas to St. Peters Road:

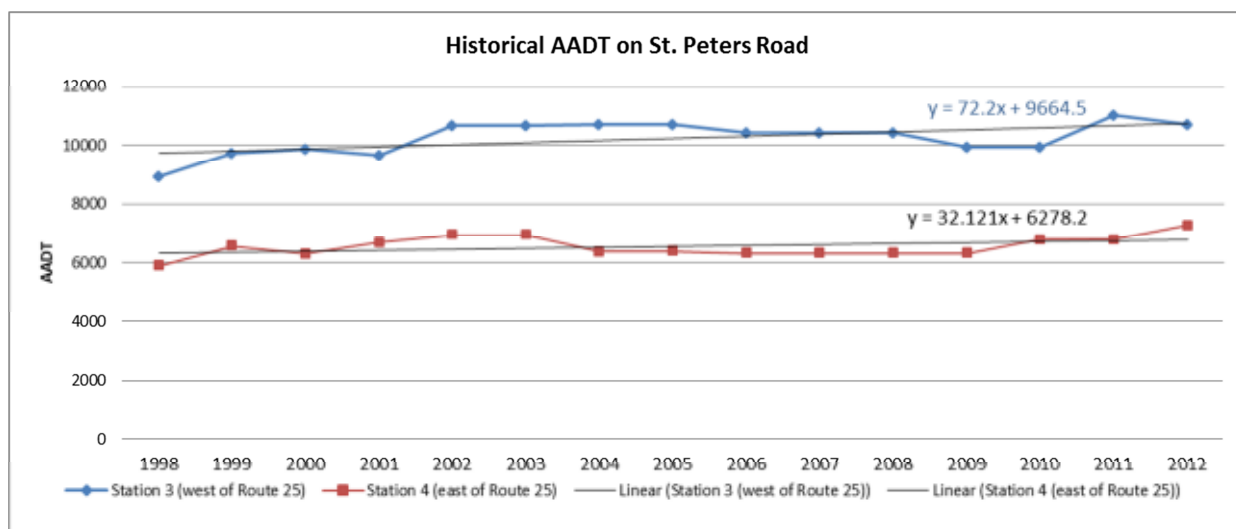
- St. Peters Road is characterized as a two-lane Arterial Road with a posted speed of 60 km/h from Charlottetown Perimeter Highway to Grant Street; speeds up to 90 km/h are permitted east of Route 25 and 50 km/h west of the Charlottetown Perimeter Highway. St. Peters Road crosses the Charlottetown Perimeter Highway with a signalized intersection. All other intersections on St. Peters Road, within the study area, are controlled by Two-way Stop-Controls (i.e. through movements on St. Peters Road are free-flow).
- Charlottetown Perimeter Highway is a Provincial Highway, part of the Trans-Canada Highway system, with a posted speed of 70 km/h within the study area.
- Route 25 is a two-lane Collector Highway with a posted speed of 80 km/h.

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A total of 12 intersections on St. Peters Road were analyzed for this study, including three four-leg intersections (at Charlottetown Perimeter Highway, at Norwood Road/Northridge Parkway, and at East Royalty Road/Heartz Road); and nine 'T' intersections (at Oakland Drive, at Macrae Drive, at Robertson Road, at Angus Drive, at Woodleigh Drive, at Macwilliams Road, at Greenwood Drive, at Grant Street, and at Route 25).

Historical Traffic Volume

Historical traffic volumes on St. Peters Road reveal **the average of the annual traffic growth rates from the two stations is about 0.5%**. This has meant an increase between 1998 and 2010 of about 1500 trips per day. This trend is shown in the following graph.



Existing (2013) Traffic Volume

Traffic analysis tends to focus on the peak hours (morning and afternoon) as this is when the pressure on the road is greatest. During the morning peak hour, traffic on St. Peters Road is understandably highest in the westbound direction. During this period, about 650 vehicles enter St. Peters Road at the Route 25 intersection and about 1,100 vehicles enter the Charlottetown Perimeter Highway (Route 1) intersection from the St. Peters Road.

Traffic is highest in the eastbound direction during the afternoon peak hour when about 1,300 vehicles enter St. Peters Road at the Charlottetown Perimeter Highway (Route 1) intersection; this volume is reduced to about 670 vehicles after the Route 25 intersection. These figures indicate that **in the morning peak period, about 59 percent of traffic consists of through volumes and during the afternoon, 51% is through volumes.**

Micro-simulation Model

A traffic operational analysis was conducted using a micro-simulation model, developed to reflect the existing network configuration. An aerial image was used for reference and site visits were used to verify the existing lane configurations and intersection controls (i.e. signal/stop controlled). Current signal timing plans were also provided by TIR. In order to assess existing conditions and to calibrate the current year micro-simulation model, data about lane configurations, storage lanes, priority rules, signal timing plans, existing truck percentage, posted speed and routing decisions were fed into the model to simulate conditions as precisely as possible. Additional modelling was used to estimate the volume to capacity (V/C) ratio for the signalized intersection and Level of Service (LOS) analysis. The model uses the *Highway Capacity Manual* guidelines for calculating the v/c ratio considering such factors as the volume, allocated green time, heavy truck percentage, and lane utilization factor.

Level of Service (LOS)

Level of Service (LOS) is a measure used to assess or describe the effectiveness of road infrastructure. In its simplest usage, six letters – ‘A’ to ‘F’ are used to categorize traffic flow, ‘A’ being free flow and ‘F’ representing effective “gridlock”. The goal of transportation authorities generally is to maintain LOS no worse than LOS ‘D’.

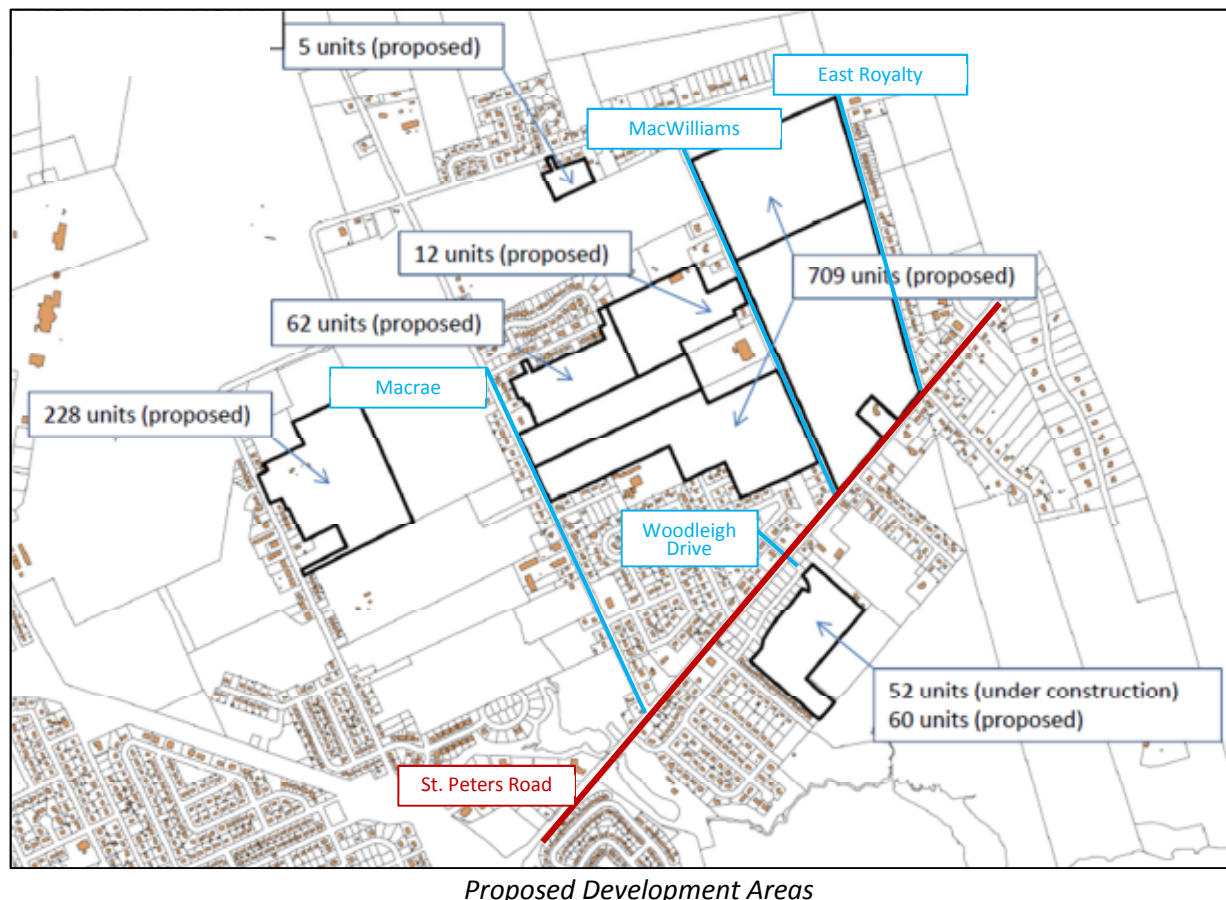
Model Results

The intersection operational analysis results indicate the following existing traffic operations:

- The level of service of through and turning movements from Route 2 at all unsignalized intersections are at acceptable ‘A or ‘B’ levels due to the free flow conditions and the presence of left turn lanes for eastbound vehicles. LOS for vehicles exiting the stop controlled intersections varies widely from ‘A’ to ‘F’.
- The St. Peters Road and Charlottetown Perimeter Highway intersection is the only signalized intersection in the study area. All other intersections are ‘Two-way Stop-Control’.
- The intersection at Charlottetown Perimeter Highway is operating at overall level of service LOS ‘C’ and ‘D’ respectively during both morning and afternoon peak hours. All movements are operating at an acceptable LOS except for the northbound right turn movement, which is operating at LOS ‘E’ during the afternoon peak hour.
- Approach traffic on the minor legs (Norwood Road, Oakland Drive, Macrae Drive and Robertson Road) is operating at undesirable LOS (‘E’/‘F’) during peak hours.

Future Traffic

The future year traffic volume for 2026 was estimated using the background traffic and site traffic (demand from proposed development). By the future (2026) planning horizon, about 1100 additional dwelling units are proposed in the study area. The locations of the proposed dwelling units are presented in the following map prepared by the planning department of the City of Charlottetown.



In addition to the proposed dwelling units, a commercial establishment was proposed as part of the planning review currently being undertaken by the City. This was included in the analysis, though it should be understood that there is no commitment to build such a development. The inclusion of this land use, between MacWilliams Road and East Royalty Road, is assumed for analysis purposes to have 250 employees.

Based on our analysis, we estimate that the proposed and potential new development in the Study Area would generate about 530 additional trips and attract about 720 trips during afternoon peak hour. It is assumed that trips during morning peak hour would be of a similar magnitude and in the opposite direction from that of afternoon.

Trip Distribution and Traffic Volume

Total traffic volumes for 2026 were estimated by adding the site traffic to the background traffic. Most of the site-generated traffic demand would access to and from the St. Peters Road. During the afternoon peak hour, this would result in about 1,900 vehicles per hour in the eastbound direction and about 1,100 in the westbound direction on St. Peters Road (between Charlottetown Perimeter Highway and Norwood Road/Northridge Parkway). As afternoon commuters turn off the road to their own neighbourhoods, eastbound traffic on St. Peters Road would steadily drop to about 1,000 vehicles per (peak) hour at the intersection of Route 25.

Future Traffic Analysis

This section documents the future (2026) condition analysis for two scenarios:

- Scenario A (Do-Nothing): existing network configuration (i.e. lane configuration and intersection control types) except for the Woodleigh Drive intersection which is converted from a T-intersection to a 4-leg intersection to provide a connection to the proposed development south of St. Peters Road (a road allowance, called Bambrick Road, currently exists).
- Scenario B (4-Lane Widening for St. Peters Road): an additional lane in each direction, resulting in a 4-lane section, not because of conditions on the main line but because of the potential to improve access from the minor legs. Depending on the traffic volume, two lanes in one direction can result in introduced gaps in traffic flow, which entering traffic can take advantage of.

The operational analysis showed that under Scenario A, study area intersections would experience long delays and poor level of service. **It is not a real option: the gradual deterioration in traffic operations and development occurs, combined with increasingly long delays on the minor streets, indicate the need and justification for network improvements.** Currently, without intersection controls, through traffic on St. Peters Road would operate under free flow conditions. If widened to 4 lanes, delays and queue lengths would be significantly reduced at the study area intersections. However, even if the road is widened, some movements would continue to operate at an undesirable level of service (E or F) and would therefore require additional improvements. The analysis indicates intersection modifications would be needed at:

- St. Peters Road at Charlottetown Perimeter Highway,
- Norwood Road/Northridge Parkway,
- MacRae Drive,
- Woodleigh Drive, and
- MacWilliams Road.

The intersection-specific improvements could include the provision of turning lane(s) and signalization / roundabout. As stated in the Terms of Reference, “both TIR and the City have introduced modern roundabouts within the Charlottetown area and they appear to be very well accepted by users thus this may be the preferred form of control.”

Evaluation of Options

A total of eight intersections were analyzed for possible upgrade:

- | | |
|------------------------|-------------------------|
| • Norwood / Northridge | • Angus |
| • Oakland | • Woodleigh |
| • MacRae | • MacWilliams |
| • Robertson | • East Royalty / Heartz |

St. Peters Road at Charlottetown Perimeter Highway was not analyzed because issues related to this major intersection are beyond the current study scope. As well as the eight candidate locations listed above, three additional modified intersections were also analyzed, for a total of eleven options evaluated in total. The modifications included:

- realigning MacRae Drive to form a 4-legged intersection with Oakland,
- extending Hanmac Drive (in developing Emmerly Estates) to form a four-legged intersection with Angus Drive, and
- creating a four-legged intersection at MacWilliams Road.

The evaluation was based on several planning vectors and criteria as outlined below.

- | | |
|-----------------------|----------------------------|
| • Road classification | • 4-way intersection |
| • Principal street | • LOS (critical movements) |
| • Strategic location | • Support to AT |

Vectors were rated from 0 to 4 where 0 is a low score meaning least important and 4 is the highest score being most important. Following is a description of each vector. The rating increase by doubling the previous value, as follows: 0 > 1 > 2 > 4.

- **Road classification:** Classed as or functions as a collector; serves significant traffic flows. The ratings are: local (0); functional (2); existing (4)
- **Principal street:** Important within a neighbourhood; may be local. The ratings are: modestly important (1); moderately important (2); important (4)
- **Strategic location:** Likelihood to accommodate anticipated future development / traffic demand. The ratings are: unlikely (0); moderately likely (1); somewhat likely (2) highly likely (4)
- **4-way intersection:** This is an assessment of the potential for the street to function as a 4-way intersection. The ratings are: unlikely (0); potential (2); existing (4)
- **LOS (critical movements):** This reflects the technical assessment of current level of service on the minor streets. The ratings are: LOS A or B (1); LOS C or D (2); LOS E or F (4). No score of 0 was given.
- **Support to AT:** This vector considers land uses that will be served; an intersection with nearby land uses attractive to pedestrians will score more highly than an intersection without such uses (existing or future under current planning scenarios). The ratings are: few land uses (1); some (2); several (4)

The following figure summarizes the evaluation in graphical form. A high score is preferred.

Assessment of intersection control prioritization - East Royalty

Vector	Definition	Existing conditions										Potential Modifications									
		Norwood / Northridge	Oakland	Macrae	Robertson	Angus	Woodleigh	Macwilliams	East Royalty / Heartz	Angus / Hannac - 4 leg	Oakland / Macrae - 4-leg	Macwilliams - 4-leg									
Road classification	Classed as or functions as a collector; serves significant traffic	4	0	4	0	0	2	4	4	2	4	4	4	4	4	4	4	4	4	4	22
Principal street	Important within a neighbourhood; may be local	2	1	4	2	1	2	4	1	2	4	4	4	4	4	4	4	4	4	4	21
Strategic location	Accommodates anticipated future development / traffic demand	2	1	4	1	0	2	4	2	2	4	4	4	4	4	4	4	4	4	4	16
4-way intersection	Unlikely (0); potential (2); existing (4)	4	2	2	0	2	4	2	4	2	4	4	4	4	4	4	4	4	4	4	17
LOS (critical movements)	LOS A or B (1); LOS C or D (2); LOS E or F (4)	4	4	4	4	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	20
Support to AT	Nearby land uses attractive to pedestrians (existing or future)	4	1	1	2	4	1	4	4	4	1	4	4	4	4	4	4	4	4	4	13
Score		20	9	19	9	9	13	20	17	16	21	22									
Scoring scale		0	1	2	3	4	5	6	7	8	9	10									

From this analysis presented above, the following locations are proposed for upgrade:

- **Norwood Road / Northridge Parkway:** This intersection is located near the signalized intersection of St. Peters Road and the Charlottetown Perimeter Highway. Double southbound left turn lanes are recommended at the major intersection. Because of its proximity to the Perimeter Highway—about 200 metres—the Norwood / Northridge intersection should be addressed as part of an overall strategy that considers both intersections, including pedestrian activity and requirements. Additional analysis is required, beyond the scope of this study, to determine control options.
- **MacRae Drive:** Apart from Norwood / Northridge and Oakland, MacRae Drive is nearest to the Perimeter Highway. As a result of its location, it experiences the most congestion and currently warrants the addition of a separated turning lane. It should therefore be a key candidate for upgrade. Before undertaking any improvements however, consideration should be given to realigning the eastern end of the street to allow reconfiguration of the intersection as a roundabout/traffic signals that would bring in Oakland as a fourth leg. Study would also be required to understand local environmental considerations, given the location's proximity to Andrews Pond.
- **Angus Drive:** Extend this street across St. Peters Road creating a new four-way controlled intersection or roundabout with Hanmac. At the same time, close Robertson, extend Rilla Road, and connect Angus to Tara Heights by extending Short Street. Note: this intersection was not explicitly evaluated in the transportation demand model. However, if treated as indicated above, it would result in the functional replacement of Woodleigh as a principal street. It is better situated than Woodleigh from the perspective of progression on the main line. From a turning perspective, it does not require an added turning lane; however, intersection control (signals or roundabout) would offer immediate benefit for AM commuter traffic originating south of St. Peters Road. Note that any form of intersection control will introduce delay on the main line (St. Peters Road).
- **MacWilliams Road:** This intersection is a strong candidate for upgrade as it is likely to receive a substantial amount of residential traffic and a possible retail/commercial centre would generate additional traffic volumes. Any improvements at this location should include a review of approach grades from the east.

Suggested improvement timeline

Based on the foregoing, the following timeline of improvements is recommended:

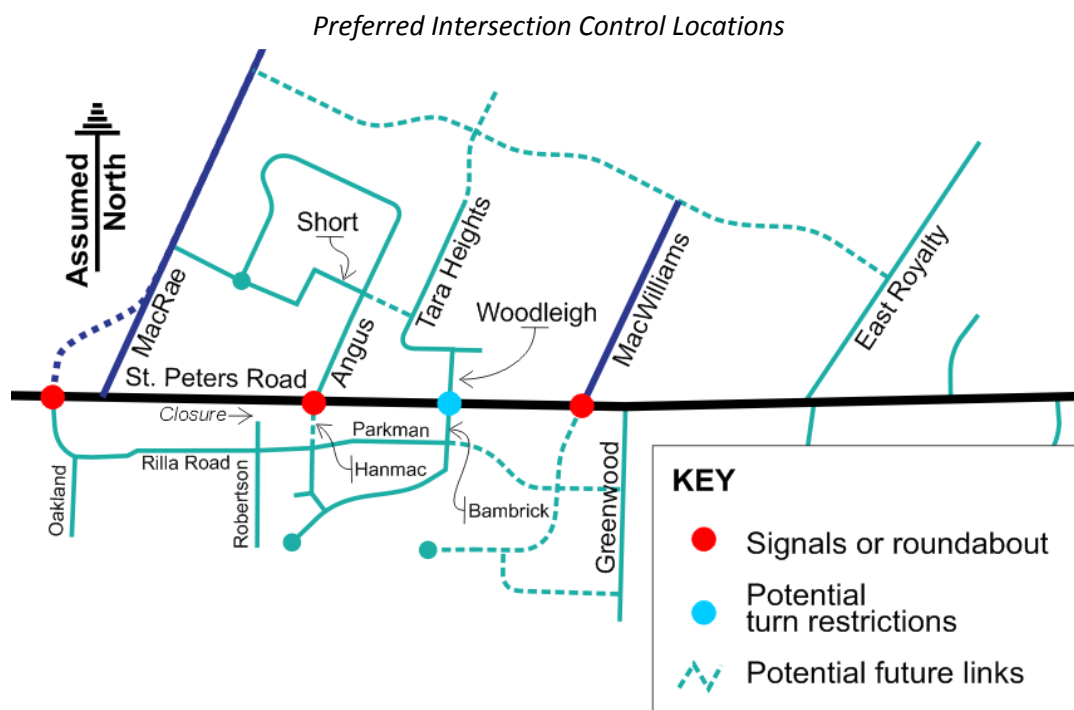
- **Short- to medium term – 1 to 5 years.**
 - Angus / Hanmac: create controlled four-way intersection, close Robertson, extend Rilla Road, and connect Angus to Tara Heights by extending Short Street. Signalization of this intersection may be considered.
 - West of Andrews Pond, upgrade St. Peters Road to Perimeter Highway including an additional eastbound lane that would serve northbound right turn from the

Perimeter Highway and an additional westbound lane on St. Peters Road west of the Perimeter highway (part of 4-laning).

- Upgrade Norwood / Northridge intersection based on further study.
- **Medium term – 5 to 10 years**
 - Upgrade MacRae Drive and possibly Oakland Drive intersections. Encourage developer to phase development served by MacRae prior to embarking on the area served by MacWilliams.
- **Medium to long term – 5 to 10 years plus**
 - Upgrade MacWilliams at St Peters Road as demand warrants.
 - Implement turn restrictions at Woodleigh Drive/St. Peters Road intersection.
 - St. Peters Road to 4 lanes – Field investigations by the Province of Prince Edward Island indicate on a preliminary basis that the corridor through East Royalty (east of Andrews Pond) could be widened to four lanes by restriping the current asphalt and reducing the paved shoulder. Associated with this change, within the medium term or as the community begins to expand, a multi-use trail should be constructed on one side for use by pedestrians and cyclists. The existing sidewalk should be made contiguous.

Related network improvements (for consideration)

The following diagram summarizes preferred locations for intersection control as discussed above. It also shows potential linkages that would be supportive of these upgrades.



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A key goal of these suggested changes is to improve internal traffic circulation on either side of St. Peters Road, thus maximizing the potential for residents to access the controlled intersections. At such time as public transit is extended into the East Royalty area, these linkages could also form the basis of an efficient transit route. The linkages include:

- realignment of MacRae Drive opposite Oakland, thus providing improved access to the south of St. Peters Road
- extension of a continuous street north of St Peters Road from MacRae to East Royalty Road.
- extension of Rilla Road to Greenwood; as this facility runs parallel to St Peters Road, it will provide local access to the entire neighbourhood south of St. Peters Road, while minimizing conflicts on the through road.
- closure of Robertson Road at St. Peters Road
- extension of Angus to Parkman (by connecting Hanmac to St. Peters Road); signalization at St. Peters Road; extension of Short Street to Tara Heights
- associated with the above, add a driveway to the Petro Canada providing a direct connection to Angus Drive to minimize short trips on St. Peters Road from the internal residential streets and also provide access to the signalized intersection at Angus as noted above.

In addition to the upgrade of intersections, street extensions and closures as noted above, and future widening of St. Peters Road to four lanes, the following intersections would require additional storage lanes.

- Charlottetown Perimeter Highway: provide double southbound left turn lanes
- Norwood Road/Northridge Parkway: provide southbound right turn lane and change dedicated northbound right turn in to shared northbound through/right turn lane
- Oakland Drive: provide storage lane for northbound right turn lane
- MacRae Drive: provide storage lane for southbound left turn lane
- Angus Drive: provide storage lane for southbound left turn
- Woodleigh Drive: provide storage lane for southbound right turn and northbound left turn (unless turn restrictions are implemented)
- MacWilliams Road: provide storage lane for southbound left turn
- East Royalty Road: provide storage lane for southbound right turn.

Discussion

The drawing shown above distills the results of the analysis by presenting a network concept that maintains the functionality of St. Peters Road as a provincial highway while improving access to selected intersecting streets. By improving network connectivity between subdivisions, it allows drivers to choose routes that take them to controlled intersections. Meanwhile the signals (or roundabouts) on St. Peters

Road are regularly spaced as preferred for progression. Turn restrictions at Woodleigh would limit conflicts on the main line.

Concluding thoughts

Traffic is predicted to grow on St. Peters Road to as many as 1,900 vehicles per hour by the time the proposed developments are completed in East Royalty, as expected by 2026. This is nearly a doubling of current traffic volumes on the roadway. This analysis considered a number of strategies to address this growth, including road widening, intersection controls such as signals or roundabouts, and storage/turning lanes on the minor legs. These changes imply that the nature of St. Peters Road will ultimately change from a predominant through road facility to one that balances local access with an arterial function. Delay will necessarily be added to the highway when intersection controls are introduced.

Readers should also be reminded that travel demand changes over time. We are also entering a period of extraordinary change in transportation and personal mobility challenges and opportunity, including demands for more active transportation opportunities, public transit, and the potential introduction of autonomous vehicles (which could have an impact on road capacity, among other things). The assumptions contained in this report therefore should to be reviewed from time to time as land development proceeds and the impacts are tested against empirical findings. Adjustments in the timing of upgrades and other improvements may need to be revisited as a result of this analysis. Also, detailed study would be required to establish the feasibility of using roundabout at any of the intersections, as operationally they may not optimize LOS.